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Drawings: 8 pages

[54] Title: Method for discriminating the authenticity of paper money and apparatus thereof

[57] Abstract

The present invention relates to a method for discriminating the authenticity of paper money and apparatus thereof. The traveling paper money is irradiated by light-emitting elements at least including an ultraviolet light, and then the data carried by the irradiated light is compared with the preset data of the genuine paper money to discriminate the authenticity of paper money. The apparatus includes an identification portion having photosensing elements which make the light emitted from the light-emitting elements penetrate through the paper money or be reflected by the paper money so as to carry data, and a switch corresponding to the data of the paper money type. The present invention can obtain the explicit differences for the data of waveforms and wavelengths obtained from the genuine paper money and counterfeit paper money, and can judge the genuine paper money and counterfeit paper money visually according to the change of color.

## *Claims*

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What is claimed is:

1. A method for discriminating the authenticity of paper money, including: irradiating traveling paper money with light-emitting elements; comparing data carried by the irradiated light with preset data of the genuine paper money to thereby discriminate the authenticity of paper money, wherein said light-emitting elements at least include an ultraviolet-emitting element to make the ultraviolet light penetrate through or be reflected by the paper money so as to compare data carried by the penetrated or the reflected ultraviolet light with the data of the genuine paper money.
2. A method for discriminating the authenticity of paper money as claimed in claim 1, wherein except for said ultraviolet-emitting element, an infrared-emitting element with near infrared light and visible light-emitting elements with red light are also be used.
3. A method for discriminating the authenticity of paper money as claimed in claim 2, wherein said ultraviolet-emitting element and said infrared-emitting element with near infrared light are located in the line along the traveling direction of the paper money.
4. A method for discriminating the authenticity of paper money as claimed in claim 2 or 3, wherein said visible light-emitting elements with red light are received by photosensing elements for infrared light with near infrared light, installed on the portion deviating from the middle line of the traveling paper money.
5. A method for discriminating the authenticity of paper money as claimed in one of claims 2 - 4, wherein said ultraviolet-emitting element and said infrared-emitting element with near infrared light are positioned in the middle line of the traveling paper money, and the visible light-emitting elements with red light are corresponded to six divided portions formed by the middle line and three broken lines of the paper money so as to irradiate edge portions of the paper money.
6. A method for discriminating the authenticity of paper money as claimed in one of claims 2 - 5, wherein the visible light-emitting elements are one of the white light, pink

light, yellow light, orange light, blue light and green light etc. or their aggregation, except for the red light, partially make the patterns on the inner or the outer surface of the paper money give out fluorescence, which is identified as waveforms.

7. A method for discriminating the authenticity of paper money as claimed in one of claims 1 - 6, wherein the light data from said light-emitting elements is focused on the data of color including coating such as fluorescence and pigment etc..

8. A method for discriminating the authenticity of paper money as claimed in one of claims 1 - 7, wherein the photosensing amount of the photosensing elements of said penetrated light, or the reflected light is integrated for the position of the paper money so as to calculate the area, when the area is bigger than a fixed value, the paper money is determined as a counterfeit paper money made of common paper.

9. A method for discriminating the authenticity of paper money as claimed in one of claims 1 - 7, wherein the waveforms of the penetrated light or the reflected light are compared with the waveforms of the genuine data.

10. A method for discriminating the authenticity of paper money as claimed in one of claims 1 - 7, wherein the change of color of the patterns of the paper money is tested through the irradiation from said light-emitting elements.

11. A method for discriminating the authenticity of paper money as claimed in one of claims 1 - 10, wherein the existence of security thread (metal threads used to prevent counterfeit) is tested.

12. A method for discriminating the authenticity of paper money as claimed in one of claims 1-11, wherein in said light-emitting elements, the filters absorbing light from the other light sources or the filters blocking the ultraviolet light beyond a given gradation value are installed, and the test is carried out in the status of superposition of the filters.

13. An apparatus for discriminating the authenticity of paper money, comprising an identification portion having photosensing elements which make the light emitted from the light-emitting elements penetrate through the paper money or be reflected by the paper money so as to carry data, and a switch corresponding to each kind of paper money is

formed in said identification portion.

14. An apparatus for discriminating the authenticity of paper money as claimed in claim 13, wherein the inserting width is adjustable corresponding to the type of paper money as object.

15. An apparatus for discriminating the authenticity of paper money as claimed in claim 13 or 14, wherein a base end of the receiving tray for receiving the passed paper money is pivotally installed on the main body, and when the apparatus is not used, the receiving tray is rotated as a cover plate in the top surface of the main body so as to reduce the size of the apparatus.

## *Description*

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Method for discriminating the authenticity of paper money and apparatus thereof

### FIELD OF THE INVENTION

The present invention relates to a method for discriminating the authenticity of paper money and apparatus thereof, especially relates to a method and apparatus for discriminating the counterfeit paper money manufactured by the fine color copy machines, color scanners connected to the personal computer, and printers, etc., which are very popular in recent years.

### DESCRIPTION OF THE RELATED ART

In the past days, the discrimination methods for the authenticity of paper money is performed by the following methods: testing the magnetic field distributed on the paper money, testing the objects such as watermark, printed pattern or image identification, etc.. But the methods of the past often fail for the discrimination when the paper money even are processed simply, and especially when the counterfeit paper money are manufactured through image process by the color copy machines developed by high technology and the color scanners, their data are close to that of the genuine paper money, so that it is difficult to completely discriminate the authenticity properly.

Therefore, people recently use such a method, focused on images, printed patterns, or ink components and color etc., that the genuine data is stored, and then the genuine data is compared with the data of the paper money inserted from the inserting opening.

In the above data comparing method, an optical system is used, that is, the light-emitting elements irradiate the traveling paper money with light and make the light penetrate through the paper money or be reflected by the paper money so that the photosensing elements receive the optical signals carrying the information to thereby compare the received information with the genuine data.

The data of the optical system are usually shown as waveforms and wavelengths. According to the type of light (type of wavelength) used in the light-emitting element, the data shows a long wavelength and a short wavelength corresponding to the paper money, therefore it is clearly ascertained that there exist the portion on which the authenticity can be tested, and the portion on which the authenticity can not be tested.

In addition, a special type corresponding to the type of the light is usually used for the

photosensing element, which corresponds to the utilized light-emitting element, but for example, when a visible light with red light is used, its waveform sometimes can not achieve the status of discriminating the authenticity distinctly, and the ambiguous portion is remained.

## SUMMARY OF THE INVENTION

The present invention is aimed at the conditions and problems above-mentioned. The object of the present invention is to provide a method and apparatus for discriminating the authenticity of paper money to solve the above-mentioned problems. In the method and apparatus, all portions of the paper money can be irradiated by using an optical system to confirm the receiving data of waveform etc., and to test the difference of the quality of paper, so that the discrimination of authenticity can be carried out with high precision, even if the counterfeit paper money is finely manufactured by using color copy machines and color scanners.

In order to achieve the above object, the present invention relates to the method for discriminating the authenticity of paper money, including: irradiating traveling paper money with light-emitting elements, and then comparing data carried by the irradiated light with preset data of the genuine paper money, thereby discriminating the authenticity of paper money, wherein said light-emitting elements at least include an ultraviolet-emitting element to make the ultraviolet light penetrate through or be reflected by the paper money so as to compare data carried by the penetrated or the reflected ultraviolet light with the data of the genuine paper money; wherein except for said ultraviolet-emitting element, an infrared-emitting element with near infrared light and visible light-emitting elements with red light are also be used; wherein said ultraviolet-emitting element and said infrared-emitting element with near infrared light are located on the line along the traveling direction of the paper money; wherein said visible light-emitting elements with red light are received by photosensing elements for infrared light with near infrared light, installed on the portion deviating from the middle line of the traveling paper money; wherein said ultraviolet-emitting element and said infrared-emitting element with near infrared light are positioned on the middle line of the traveling paper money, and the visible light-emitting elements with red light are corresponded to six divided portions formed by the middle line and three broken lines of the paper money so as to irradiate edge portions of the paper money; wherein the visible light-emitting elements are one of the white light, pink light, yellow light, orange light, blue light and green light etc. or their aggregation, except for the red light, partially make the patterns on the inner or the outer surface of the paper money

give out fluorescence, which is identified as waveforms.

In addition, the feature of the method for discriminating the authenticity of paper money of the present invention is that the light data from said light-emitting elements is focused on the data of color including coating such as fluorescence and pigment etc.; wherein the photosensing amount of the photosensing elements of said penetrated light, or the reflected light is integrated for the position of the paper money so as to calculate the area, and when the area is bigger than a fixed value, the paper money is determined as a counterfeit paper money made of common paper; wherein the waveforms of the penetrated light or the reflected light are compared with the waveforms of the genuine data; wherein the change of color of the patterns of the paper money is tested through the irradiation from said light-emitting elements; wherein the existence of security thread (metal threads used to prevent counterfeit) is tested; wherein in said light-emitting elements, the filters absorbing light from the other light sources or the filters blocking the ultraviolet light beyond a given gradation value are installed, and the test is carried out in the status of superposition of the filters.

Furthermore, the feature of the apparatus for discriminating the authenticity paper money of the present invention is that the apparatus includes an identification portion having photosensing elements which make the light emitted from the light-emitting elements penetrate through the paper money or be reflected by the paper money so as to carry data, and a switch corresponding to each kind of paper money is formed in said identification portion; wherein the inserting width is adjustable corresponding to the type of paper money as object; wherein a base end of the receiving tray for receiving the passed paper money is pivotally installed on the main body, and when the apparatus is not used, the receiving tray is rotated as a cover plate in the top surface of the main body so as to reduce the size of the apparatus.

Because of the above-mentioned technical solution including the coating on the surface of the paper money, and the irradiation light testing the small eyelets of the paper money, the paper quality can be distinguished definitely, and a particular luminous color and the irradiation of visible light can be obtained, therefore the discrimination can be achieved by eyes. In addition, Because a plurality of light-emitting elements are used at the same time, scanning the objective portions of the paper money by irradiation and comparing with the genuine data can be performed in many ways, these make it possible to discriminate more clearly and more definitely. Furthermore, the hidden watermark forming a special result is tested well, and the native paper money and the foreign paper money can be tested sufficiently.

The method and apparatus for discriminating the authenticity of paper money of the present invention are achieved by the above manner, therefore, the explicit differences can be obtained corresponding to the data of waveforms and wavelengths got from the genuine paper money and the counterfeit paper money, and the authenticity can be discriminated by eyes according to the change of color. Therefore, the precision of discrimination are enhanced greatly, and the inexpensive products without malfunction and mis-operation can be provided to the demander, based on its facility of the structure as a discrimination device.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plane view of an embodiment of a method for discriminating the authenticity of the penetrating type of paper money in accordance with the present invention;

Fig. 2 is a cross-sectional view taken along the line A-A in Fig. 1;

Fig. 3 is a view illustrating an area calculated by integrating the photosensing amount in the position of the paper money;

Fig. 4 is a plane view showing the installation of the light-emitting elements including visible rays;

Fig. 5 is a plane view showing the corresponding photosensing element;

Fig. 6 is a plane view showing another installation of the light-emitting elements;

Fig. 7 is a plane view showing the corresponding photosensing element;

Fig. 8 is a view showing waveforms received from a genuine paper money of an old 10 yuan Renminbi of China;

Fig. 9 is a view showing waveforms received from a counterfeit paper money;

Fig. 10 is a view showing waveforms received from a genuine paper money of a new 10 yuan Renminbi of China;

Fig. 11 is a view showing waveforms receiving from a genuine paper money of 20 yuan Renminbi of China;

Fig. 12 is a plane view showing an identification device (checker);

Fig. 13 is a side view;

Fig. 14 is a front view;

Fig. 15 is a three-dimensional view.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments in accordance with the present invention will be described

with reference to the accompanying drawings.

In these drawings, reference numeral 1 represents an ultraviolet-emitting element, especially represents an ultraviolet-emitting element with a wavelength of 370 nm. As shown in the Figs 4 - 7, the ultraviolet-emitting element 1 is installed in a bottom guide member or a top guide member which travels the paper money B by using a traveling member such as a roller or a transporting belt, together with an infrared-emitting element with near infrared rays and a pair of visible light-emitting elements with red rays 2, 2.

Herein, the ultraviolet-emitting element 1 can also be installed in the line of the middle line along the infrared-emitting element with near infrared light 3 and the traveling direction of the paper money B, for example, as shown in Fig. 6. The infrared-emitting element with near infrared rays 3 can also be located at the rear of the ultraviolet-emitting element 1. The visible light-emitting elements 2, 2 are symmetrically set on the positions deviating from the middle line of the traveling paper money B, and especially through corresponding to six divided portions formed by the middle line and three broken lines of the paper money the side rims of the paper money can be irradiated.

Under the condition of the above light-emitting elements 1, 2, and 3 being installed on the side of the bottom guide member, a photosensing element 5 for ultraviolet and a photosensing element 4 for infrared with near infrared light, and photosensing elements 4a, 4a for visible light are installed in a manner of facing respectively on the side of the top guide member facing to the bottom guide member. Herein, the photosensing elements 4a, 4a for visible light and the photosensing element for infrared with near infrared light 4 are the same type. The paper money B are traveled between the light-emitting elements 1, 2, 3 and the photosensing elements 4, 4a, 5, the given portions in a certain width of the paper money B are scanned, and then the light are photosensitized by the photosensing elements 4, 4a and 5.

That is, in the above embodiment, the irradiation rays surely penetrate through the eyelet of the paper money B, and penetrate through the staining layer including the coating too. The penetrated irradiation light has special luminous color. The luminous color takes on blue for counterfeit paper money under the condition of ultraviolet-emitting element 1. It is remarkably different from the comparing data of the wavelength and waveform received from the genuine paper money (referring to Figs. 8 and 9). Herein, the color component of the penetrated irradiation light can be tested and controlled by using the data of the infrared-emitting element 3 with near infrared light and visible light-emitting elements 2, 2, from this, the data of the watermark of the genuine paper money B can be compared.

The ultraviolet-emitting element 1 can be taken place by red light. The above change of color is regarded as waveform, and especially in the visible light condition, the portions deviating from the middle line of the paper money B are usually invisible portions which as a pattern change into yellow, green, golden, white and orange to be identified by fluorescence developing method. The fluorescence development can also be identified by red light as a waveform.

In addition, the photosensing amount of the photosensing elements 5, 4, 4a changes as shown in Fig. 3, with the traveling of the paper money B. Based on the above data, the photosensing amount is integrated for the position of the paper money B to thereby calculate the area a. When the area a is bigger than a fixed value, especially bigger than a saturated value, the paper money B can be determined as a counterfeit paper money made of common paper.

Furthermore, for the light-emitting elements 1, 2 and 3, additionally installing filters absorbing the light from the other light sources or breaking the ultraviolet light beyond a given gradation value can insure the precision, even though it is not shown in the figure. In addition, it is clear to know that through irradiating light sources in the status of superposition of the filters, the condition discriminating genuine and counterfeit definitely can be achieved.

Herein, the waveform shown in Figs. 8 - 11 will be described. Reference numeral 23 represents the waveform of the ultraviolet light, reference numeral 24 represents the waveform of the near infrared light, reference numeral 25 represents the waveform of the red light, especially when the Fig. 8 is compared with the Fig. 9, it is known that the waveforms and the wavelengths of the ultraviolet light 23 are greatly different. Also in the conditions of near ultraviolet light 24 and red light 25, it is known that there exists big difference when their difference is tested. That is, if synthetically testing the differences for the visible color, pattern and their waveforms and wavelengths, higher precise discrimination result can be obtained.

In addition, Figs. 12 - 15 represent a checker on which an identification portion 7 having the above performance is installed. The checker is used in finance departments such as banks or shops. Moreover, it is apparent that an identification device having the above identification performance can be installed in the automatic vending machine, exchanger etc..

In the checker, it is presumed that the present embodiment especially is used for 100 yuan and 500 yuan Renminbi of China, a sliding switch 8 is set, which can switch the checking performance based on the above objects, and lights 9, 9, 10 and 10 for indicating

YES or NO are installed to display whether it is genuine or counterfeit for each paper money.

The above identification portion 7 is set on the main body 11 and is held by two case boards 12, 12 formed on two sides accompanying with the above main body 11. In addition, in the identification portion 7, its two sides are pivotally installed in a long aperture 13 defined in the case boards 12, 12, through a dowel 14. In case a jam or repair happens, the machine can be opened through a pivot movement to take an operation upwardly.

Furthermore, an inserting guide slice 21 for the paper money B with an upwardly bent front end is formed under the front of the identification portion 7. That is, the paper money B is pressed close to the top surface of the main body 11, and is sent to the lower side of the guiding slice 21.

Moreover, on the main body 11 in front of the above guiding slice 21, width adjustable parts 22, 22 for guiding the paper money are set corresponding to the paper money B as an object. The width adjustable parts 22, 22 operate by means of rotation of the dial scale 15 installed on the front side of the main body 11.

In addition, there is a receiving tray 16, inserted into the lower side of the rear end of the case boards 12, 12, for receiving the ejected paper money B. The front end of the receiving tray 16 stands vertically to thereby form a stop wall 17, and form a slit portion 18 so that the paper money is clipped out by the fingertips easily.

The base end of the above receiving tray 16 is pivotally installed on the case boards 12, 12 in virtue of the dowel 20, through the connecting parts 19, 19(or can perform upward folding process). In no use, the above dowel 20 is utilized as an axis to rotate the base end and the base end is folded back as a whole cover plate to thereby be accommodated with little space.

As the exchange way of information between the sensor of the above light system and the central control system practically discriminating the authenticity, the voltage controlling current source (VCCS) way is utilized in Japan, and the main switchboard (MDB) way is utilized in occident. According to the present invention, from the beginning, in the discrimination system for the authenticity or the discrimination system for the type of paper money (further comprises coins or cards in system), the both systems working with the voltage controlling current source (VCCS) way and the main switchboard (MDB) way are installed, and a mechanism, for example switch, can be set to select any way according to the demand. In addition, there are many different ways in the main switchboard (MDB) way, a plurality of systems can be installed in occident products, and a

switch is installed, which can be switched according to the demand, similarly, in this case, it is obvious that the voltage controlling current source (VCCS) way can be installed at the same time. And, the power supply used for implementing the present invention, generators or batteries also can be used except for the commercial alternating current provided by the electric power companies. Especially, when the new paper money and the old paper money are current at the same time, and widths of the paper money are different, the inserting opening can be adjusted so as to insert genuine paper money with many sizes.

## Figures

Fig3

No.	Original Words (Chinese)	Translation words (English)
1	感光量	Photosensing amount
2	面积	Area
3	纸币的位置	Position of the paper money

Figs.8 - 11

No.	Original Words (Chinese)	Translation words (English)
1	停止	Stop
2	普通	Normal
3	频道	Channel
4	开	On
5	伏 / 格	Volt / Division
6	直流	DC
7	伏	Volt
8	关	Off
9	记录长度	Recording length
10	主	Main
11	缩放	Ratio
12	滤波器	Frequency filter
13	平滑	Smooth
14	带宽	Bandwidth
15	兆赫兹	MHz
16	触发器	Trigger
17	模式	Model
18	种类	Type
19	沿	Edge
20	源	Source

## [12] 发明专利申请公开说明书

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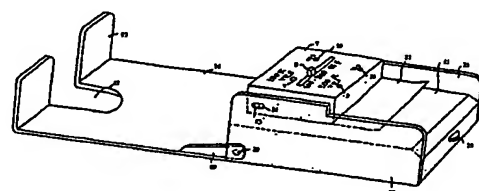
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权利要求书 3 页 说明书 8 页 附图 8 页

[54] 发明名称 纸币的真假识别方法及其装置

[57] 摘要

本发明涉及一种纸币的真假识别方法及其装置,通过至少包括紫外线的发光元件,对行走的纸币照射光,将照射后的光所携带的数据,与预先配备的真正纸币的数据进行比较,而识别纸币的真假,其装置包括识别部,该识别部具有感光元件,使来自发光元件的光,透过纸币或由纸币反射,而携带数据,还具有针对币种数据的切换开关,本发明针对由真假纸币获得的数据的波形、波长,获得明确的差异,并且可根据色彩变化,通过目视判断真假。



1.一种纸币的真假识别方法，该方法通过从发光元件，对行走的纸币照射光，将照射后的光所携带的数据，与预先配备的真正纸币的数据进行比较，由此识别该纸币的真假，其特征就在于上述发光元件至少包括紫外线的发光元件，使该紫外线透过纸币，或由该纸币反射，将上述透过的，或经反射的紫外线的数据与真正纸币的数据进行比较。

2.根据权利要求1所述的纸币的真假识别方法，其特征就在于除了上述的紫外线的发光元件以外，还采用具有近红外线的红外线的发光元件和具有红色光线的可见光线的发光元件。

3.根据权利要求2所述的纸币的真假识别方法，其特征就在于上述紫外线的发光元件和具有近红外线的红外线的发光元件按照沿纸币的行走方向位于直线上的方式设置。

4.根据权利要求2或3所述的纸币的真假识别方法，其特征就在于上述具有红色光线的可见光线的发光元件，由设置于偏离行走的纸币的中间线的部分的，具有近红外线的红外线的感光元件接受。

5.根据权利要求2~4中任一项所述的纸币的真假识别方法，其特征就在于上述紫外线的发光元件和具有近红外线的红外线的发光元件位于行走的纸币的中间线，具有红色光线的可见光线的发光元件对应于由纸币的中间线和3折线形成的6个分割部分，可照射到纸币的边缘部分。

6.根据权利要求2~5中任一项所述的纸币的真假识别方法，其特征就在于可见光线的发光元件除红色光线外为白色光线、粉色光线、黄色光线、橙色光线、蓝色光线、绿色光线等的类型，为

其中任何一个或其集合体，局部地使位于纸币的内外面上的图案荧光发光，作为波形使之辨认。

7.根据权利要求 1~6 中任一项所述的纸币的真假识别方法，其特征在于来自上述发光元件的光数据为着眼于包括荧光、颜料等的涂敷剂在内的色彩的数据。

8.根据权利要求 1~7 中任一项所述的纸币的真假识别方法，其特征在于在纸币的位置，对上述透射光，或反射光的感光元件的感光量进行积分处理，计算面积，在该面积大于一定值的场合，判定是采用普通纸的假纸币。

9.根据权利要求 1~7 中任一项所述的纸币的真假识别方法，其特征在于将上述透射光，或反射光的波形与真正数据的波形进行比较。

10.根据权利要求 1~7 中任一项所述的纸币的真假识别方法，其特征在于通过来自上述发光元件的光照射，对纸币的图案的颜色的变化进行检验。

11.根据权利要求 1~10 中任一项所述的纸币的真假识别方法，其特征在于对防伪线(用于防止伪造的金属等的线)的有无进行检验。

12.根据权利要求 1~11 中任一项所述的纸币的真假识别方法，其特征在于在上述发光元件中，设置吸收来自其它光源的光线的滤波器，用于切断一定等级值以外的紫外线的滤波器，在多个滤波器重合的状态，进行检验。

13.一种纸币的真假识别装置，其特征在于该装置包括识别部，该识别部具有使来自发光元件的光，透过纸币，或由该纸币反射，携带数据的光的感光元件，在上述识别部中，设置针对每种钱币的数据的切换开关。

14.根据权利要求 13 所述的真假识别装置,其特征针对于成为对象的纸币的钱币种类,可调整插入宽度。

15.根据权利要求 13 或 14 所述的真假识别装置,其特征针对于接纳通过后的纸币的接纳盘的基端轴枢于主体上,在不使用时,使该接纳盘在主体顶面上,作为盖板而旋转,可使整体体积减小。

## 纸币的真假识别方法及其装置

## 技术领域

本发明涉及纸币的真假识别方法及其装置，本发明特别是涉及对检验近些年来普及的精巧的采用彩色复印机、与个人计算机连接的彩色扫描仪、打印机等而形成的假纸币奏效的纸币的真假识别方法及其装置。

## 背景技术

在过去，纸币的真假识别通过下述方式实现，该方式为：检验分布存在于纸币上的磁场，检验水印、压花、或图像识别等许多的对象。但是，过去的方法使很多情况下只通过简单的工艺加工就能通过检验功能，特别是采用通过近年来的高技术开发的彩色复印机，彩色扫描仪的图像处理而形成的假纸币从数据方面来说接近真正的纸币，难于完全地进行正确的真假识别。

于是，最近，人们采用下述方法，该方法着眼于图像、压花、或墨成份、色彩等，存储其真正数据，将该真正数据，与从插入口插入的纸币的数据进行比较。

在上述数据的比较方式中，采用光线系统，即从发光元件，对装载行走的纸币照射光，使该光实现透射，或使其反射，使感光元件捕捉携带该信息的光信号，将所获得的信息与真正数据进行比较。

采用该光线系统的数据大多表现为波形、波长，根据发光元件使用的光的种类(波长的种类)，对应于纸币，其数据具有一长一

短，从而明确地判明具有可检验真假的部分及与其相反的部分。

另外，与所采用的发光元件相对应的感光元件通常采用与该光的种类相对应的专用的类型，比如，采用具有红色光线的可见光线的场合，还具有其波形未达到能够明确地区别真假的程度，残留有不明确的部分的情况。

### 发明内容

于是，本发明是针对上述已有的实际情况、问题而提出的，本发明的目的在于提供下述纸币的真假识别方法及其装置，其消除上述的问题，即使在采用彩色复印机(colour copy)、彩色扫描仪而形成的精巧的假纸币的情况下，仍可通过光线系统，良好地作用于纸币的所有部分，明确所获得的波形等的的数据，还可明确地检验纸质的差异等，全面地进行高精度的真假的识别。

为了实现上述目的，本发明涉及一种纸币的真假识别方法，该方法通过从发光元件，对行走的纸币照射光，将照射后的光所携带的数据，与预先配备的真正纸币的数据进行比较，由此识别该纸币的真假，其特征在于上述发光元件至少包括紫外线的发光元件，使该紫外线透过纸币，或由该纸币反射，将上述透过的，或经反射的紫外线的的数据与真正纸币的数据进行比较；其特征在于除了上述的紫外线的发光元件以外，还采用具有近红外线的红外线的发光元件和具有红色光线的可见光线的发光元件；其特征在于上述紫外线的发光元件和具有近红外线的红外线的发光元件按照沿纸币的行走方向位于直线上的方式设置；其中上述具有红色光线的可见光线的发光元件，由设置于偏离行走的纸币的中间线的部分的，具有近红外线的红外线的感光元件接受，上述紫外线的发光元件和具有近红外线的红外线的发光元件位于行走的纸

币的中间线,具有红色光线的可见光线的发光元件对应于由纸币的中间线和3折线形成的6个分割部分,可照射到纸币的边缘部分;其特征在于可见光线的发光元件除红色光线外为白色光线、粉色光线、黄色光线、橙色光线、蓝色光线、绿色光线等的类型,为其中任何一个或其集合体,局部地使位于纸币的内外面上的图案荧光发光,作为波形使之辨认。

另外,本发明的纸币的真假识别方法的特征在于来自上述发光元件的光数据为着眼于包括荧光、颜料等的涂敷剂在内的色彩的数据;其特征在于在纸币的位置,对上述透射光,或反射光的感光元件的感光量进行积分处理,计算面积,在该面积大于一定值的场合,判定是采用普通纸的假纸币;其特征在于将上述透射光,或反射光的波形与真正数据的波形进行比较;其特征在于通过来自上述发光元件的光照射,对纸币的图案的颜色的变化进行检验;其特征在于对防伪线(用于防止伪造的金属等的线)的有无进行检验;其特征在于在上述发光元件中,设置吸收来自其它光源的光线的滤波器,用于切断一定等级值以外的紫外线的滤波器,在多个滤波器重合的状态,进行检验。

此外,本发明的纸币的真假识别装置的特征在于该装置包括识别部,该识别部具有使来自发光元件的光,透过纸币,或由该纸币反射,携带数据的光的感光元件,在上述识别部中,设置针对每种钱币的数据的切换开关;其特征在于针对成为对象的纸币的钱币种类,可调整插入宽度;其特征在于接纳通过后的纸币的接纳盘的基端轴枢于主体上,在不使用时,使该接纳盘在主体顶面上,作为盖板而旋转,可使整体体积减小。

由于形成上述的方案,还包括位于纸币的表面的涂敷剂,照射的光还检验纸币的细微的孔眼,可明确地区别纸质,获得独特

的发光色，包括可见光线的照射，可通过目视识别。另外，同时采用多个发光元件，通过光照射扫描纸币的对象部分而与真正数据的比较也可从多个方面进行，可进行更加鲜明的，明确的判定。还有，还可良好地对形成特殊结果的隐蔽水印进行检验，此外可将国内钱币，外国钱币充分地作为检验对象。

本发明的纸币的真假识别方法及其装置按照上述方式形成。由此，针对作为由真品和假品而获得的数据的波形、波长，获得明确的差异，并且可根据色彩的变化，通过目视判断真假。因此，真假识别的精度大大提高，可根据作为识别装置的结构简易性，将没有故障、误动作，价格也较低的产品供给需要者。

#### 附图说明

图 1 为表示实施本发明的透过型的纸币的真假识别方法的实施形式的平面图；

图 2 为沿图 1 中的 A—A 线的剖视图；

图 3 为在纸币的位置对感光量进行积分处理而求出的面积的图；

图 4 为表示包括可见光线的发光元件的设置平面图；

图 5 为相对应的感光元件的平面图；

图 6 为表示发光元件的另一设置实例的平面图；

图 7 为相对应的感光元件的平面图；

图 8 为根据中国的旧 10 元真正纸币获得的各波形图；

图 9 为根据假纸币获得的波形图；

图 10 为根据新 10 元真正纸币获得的波形图；

图 11 为根据 20 元真正纸币获得的波形图；

图 12 为表示识别装置(检验器)的平面图；

图 13 为侧视图；

图 14 为正视图；

图 15 为立体图。

### 具体实施方式

下面参照附图，对优选的实施形式进行描述。

在这些附图中，标号 1 表示紫外线的发光元件，特别是表示具有波长为 370nm 的紫外线的发光元件。该紫外线的发光元件 1 象图 4~7 所示的那样，与具有近红外线的红外线的发光元件 3、一对具有红色光线的可见光线的发光元件 2，2 一起，安装于在滚轮或传动带等的运送部件的作用下使纸币 B 行走的底部导向件或顶部导向件上。

在此，紫外线的发光元件 1 还可沿具有近红外线的红外线的发光元件 3 与纸币 B 的行走方向，设置于中间线的直线上，比如，形成图 6 所示的设置。具有近红外线的红外线发光元件 3 还可位于紫外线的发光元件 1 的后方位置，可见光线的发光元件 2，2 对称地设置于偏离行走的纸币 B 的中间线的位置，特别通过与由与纸币的中间线和 3 折线形成的六个分割部分相对应，可照射到纸币的侧缘。

在上述的发光元件 1，2，3 安装于底部导向件一侧的场合，在面对的顶部导向件一侧，紫外线的感光元件 5 和具有近红外线的红外线的感光元件 4，以及可见光线的感光元件 4a，4a 以分别面对的方式设置。在这里，可见光线的感光元件 4a，4a 采用与具有近红外线的红外线的感光元件 4 等同的类型。纸币 B 在发光元件 1，2，3 和感光元件 4，4a，5 之间行走，对纸币 B 的一定宽度内的特定部位进行扫描，由感光元件 4，4a，5 进行感光。

即,在上述实施例中,来自发光元件 1, 2, 3 的照射光穿过纸币 B 的孔眼是当然的,也穿过包括涂敷剂在内的着色层,该穿过的光具有专门的发光色。此发光色在紫外线的发光元件 1 的场合,对于假纸币,该发光色呈现蓝色,在与真正纸币相比较的场合所获得的波长、波形的数据呈现显著的差别(比如参照图 8、图 9)。在这里,还采用具有近红外线的红外线发光元件 3,具有红色光线的可见光线发光元件 2,2 的数据,对穿过后色成份进行检验、控制,由此还可对正规的纸币 B 的水印部分的数据进行比较。

也可采用红色光线,而代替紫外线的发光元件 1,将上述的色彩变化视为波形,特别是在可见光线的场合,偏离纸币 B 的中间线的部分通常为不可见的部分,作为图案以荧光显色方式,变为黄、绿、金、白、橙等色而被辨认。该荧光显色也可通过红色光线作为波形辨认。

此外,感光元件 5, 4, 4a 的感光量伴随纸币 B 的行走,象图 3 所示的那样变化,根据上述数据,在纸币 B 的位置对感光量进行积分处理,由此计算面积 a。在该面积 a 大于一定值,特别大于饱和值的场合,可判定纸币 B 是采用普通组的假纸币。

还有,对于发光元件 1, 2, 3, 附加设置吸收来自其它的光源的光线的滤波器或切断一定等级值以外的紫外线等的滤波器,可确保精度,虽然这一点在图中未示出。另外,清楚地可知通过在将多个滤波器重合的状态,照射光源,从而处于能够明确地判定真假的状况。

在这里,对图 8~图 11 所示的波形图进行描述,图中的标号 23 表示紫外线的波形,标号 24 表示近红外线的波形,标号 25 表示红色光线的波形,特别是当对图 8 和图 9 进行比较时,可知道紫外线 23 的波形、波长有较大不同,同样在近紫外线 24 和红色

光线 25 的场合，可知道检验其不同时产生很大的差别。即，如果综合地检验可看到的色彩、图案与其波形、波长的差别，则可获得精度更高的真假判定结果。

另外，图 12~15 表示装载有具有上述的性能的识别部 7 的检验器，该检验器用于银行等的金融机关、或店铺等。此外，显然可在自动销售机、兑换机等中设置具有上述识别性能的识别装置。

在该检验器中，假定本实施例特别用于中国纸币 100 元，500 元，设置滑动式切换开关 8，该切换开关 8 可根据上述对象，切换检验性能，设置 YES，NO 的指示灯 9，9，10，10，其针对各纸币，显示其是真的，还是假的。

上述识别部 7 设定于主体 11 上，其与上述主体 11 一起，由设置于两侧边的外壳板 12，12 夹持。另外，在该识别部 7 中，其两侧边通过销 14 轴枢在开设于外壳板 12，12 上的长孔 13 处，在万一产生卡住，需要维修等的场合，可通过枢动运动，进行上抬操作而实现打开。

此外，在识别部 7 的前面下方，具有其前端向上方弯曲的纸币 B 的插入导向片 21。即，纸币 B 贴靠于主体 11 的顶面上，将其送入该导向片 21 的下方。

再有，在上述导向片 21 的前方的主体 11 上，对应于成为对象的纸币 B 的宽度，设置进行导向的宽度调整部件 22，22，该宽度调整部件 22，22 的运转通过使安装于主体 11 的前面的刻度盘 15 旋转的方式进行。

另外，具有接纳盘 16，该接纳盘 16 接纳插入上述的外壳板 12，12 的后端下方，经排出的纸币 B。该接纳盘 16 的前端垂直地立起，形成止动壁 17，另外形成缺口部 18，以便容易通过指尖，夹持纸币 B，将其取出。

上述接纳盘 16 的基端通过连接部件 19, 19(或可进行上折加工), 借助销 20 轴枢于外壳板 12, 12 上, 在不使用时, 以上述销 20 为轴, 实现转动, 作为整个盖板折回, 可以较小的体积接纳。

作为根据通过上述的光线系传感器获得的信息, 与实际判断真假的集中控制系统的信息交换方式, 在日本, 采用电压控制电流源(VCCS)方式, 在欧美, 采用主配电盘(MDB)方式。按照本发明, 从最初, 在纸币(在系统中还包括硬币或卡)的真假判定, 或钱币种类的判定系统中, 装载有进行上述电压控制电流源(VCCS)方式与主配电盘(MDB)方式这两种方式的系统, 设置根据需要可选择采用任何方式的机构, 比如, 切换开关。另外, 在主配电盘(MDB)方式中, 存在多种不同的方式, 作为欧美的产品, 还可装载多个系统, 设置能够根据需要进行切换的, 比如, 切换开关, 同样在此场合, 显然可同时装载电压控制电流源(VCCS)方式。并且, 为实施本发明而使用的电源, 除电力公司供给的商用的频率交流电以外, 还可使用发电机或电池, 特别是当新纸币与旧纸币同时流通时, 且多种纸币的宽度不同时, 可调整纸币插入口的尺寸, 插入多种尺寸的各个真正纸币。

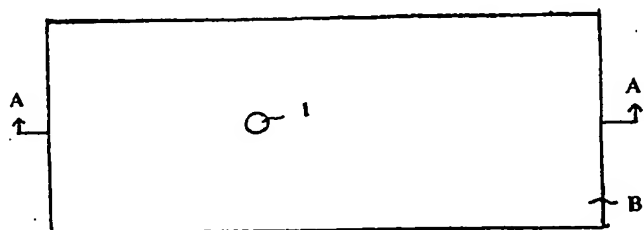


图 1

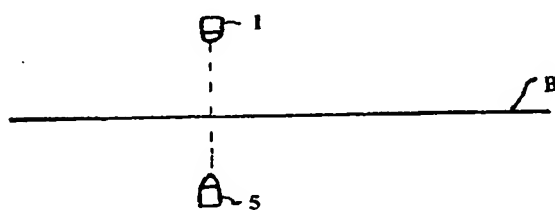


图 2

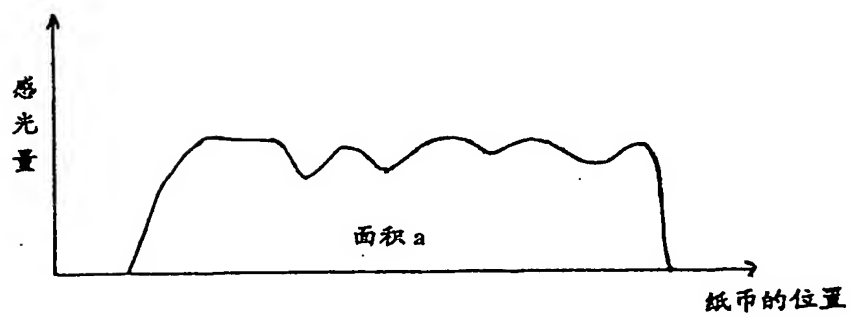


图 3

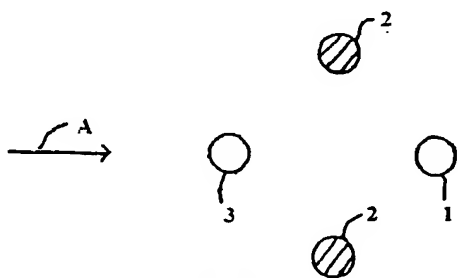


图 4

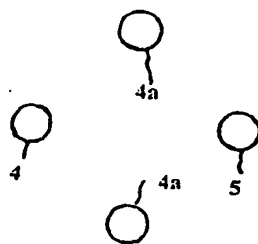


图 5

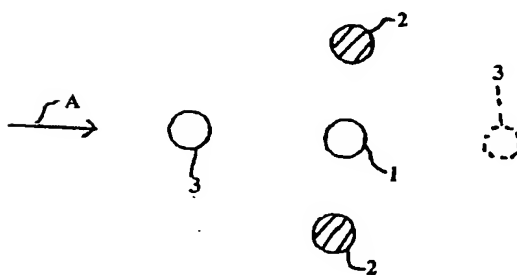


图 6

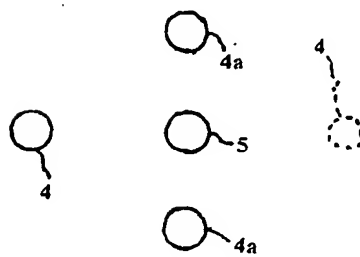


图 7

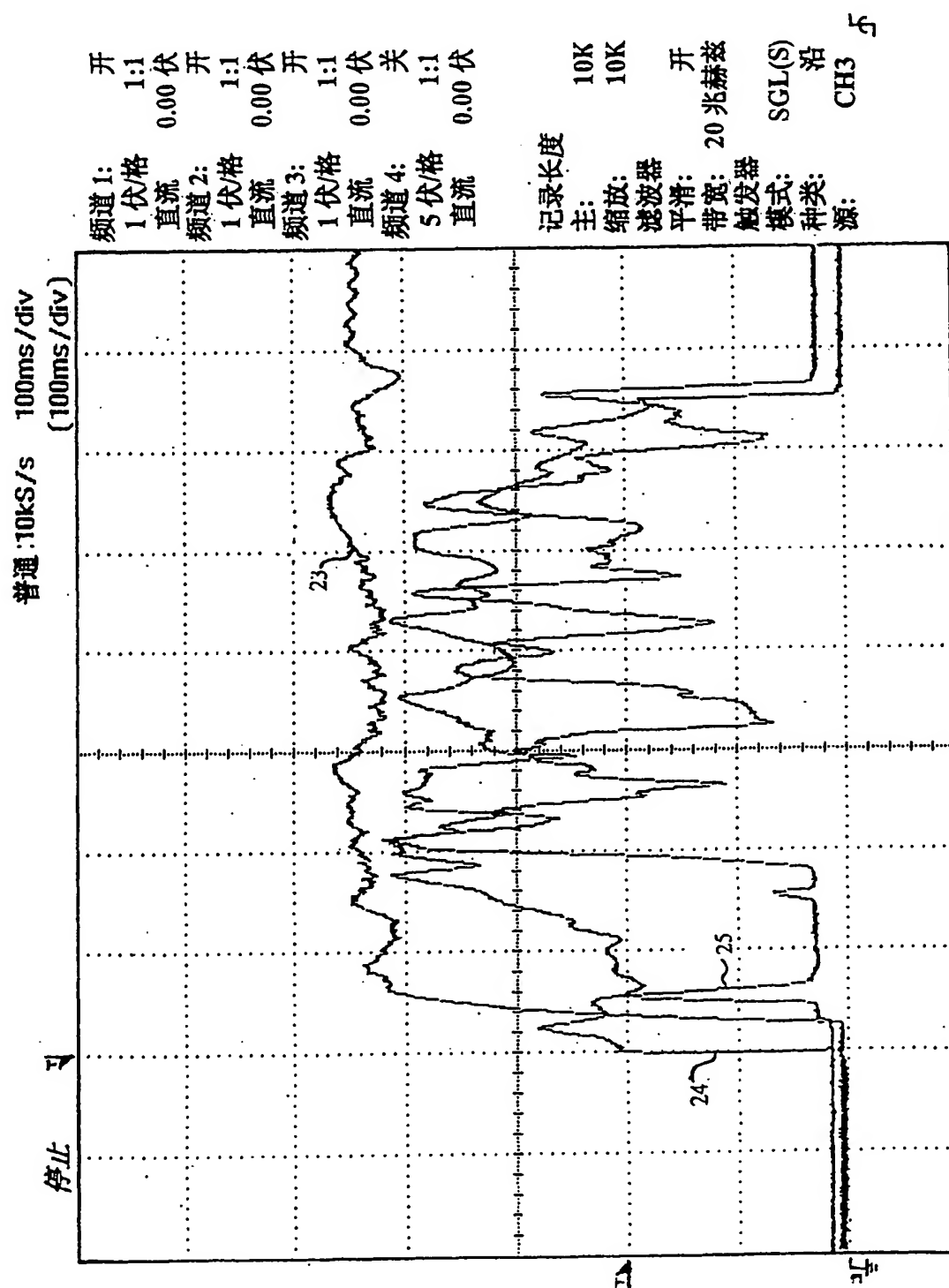


图 8

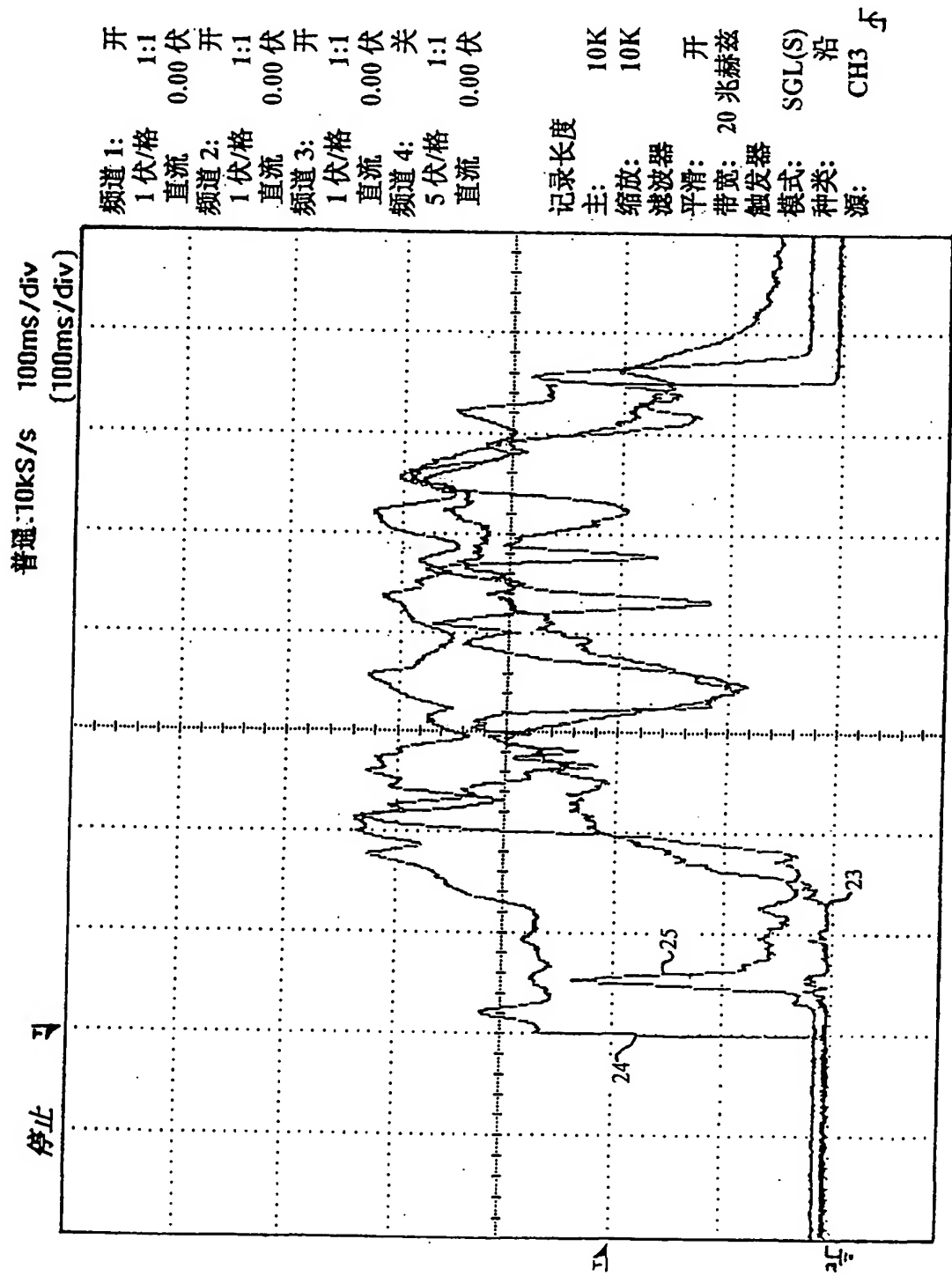


图 9

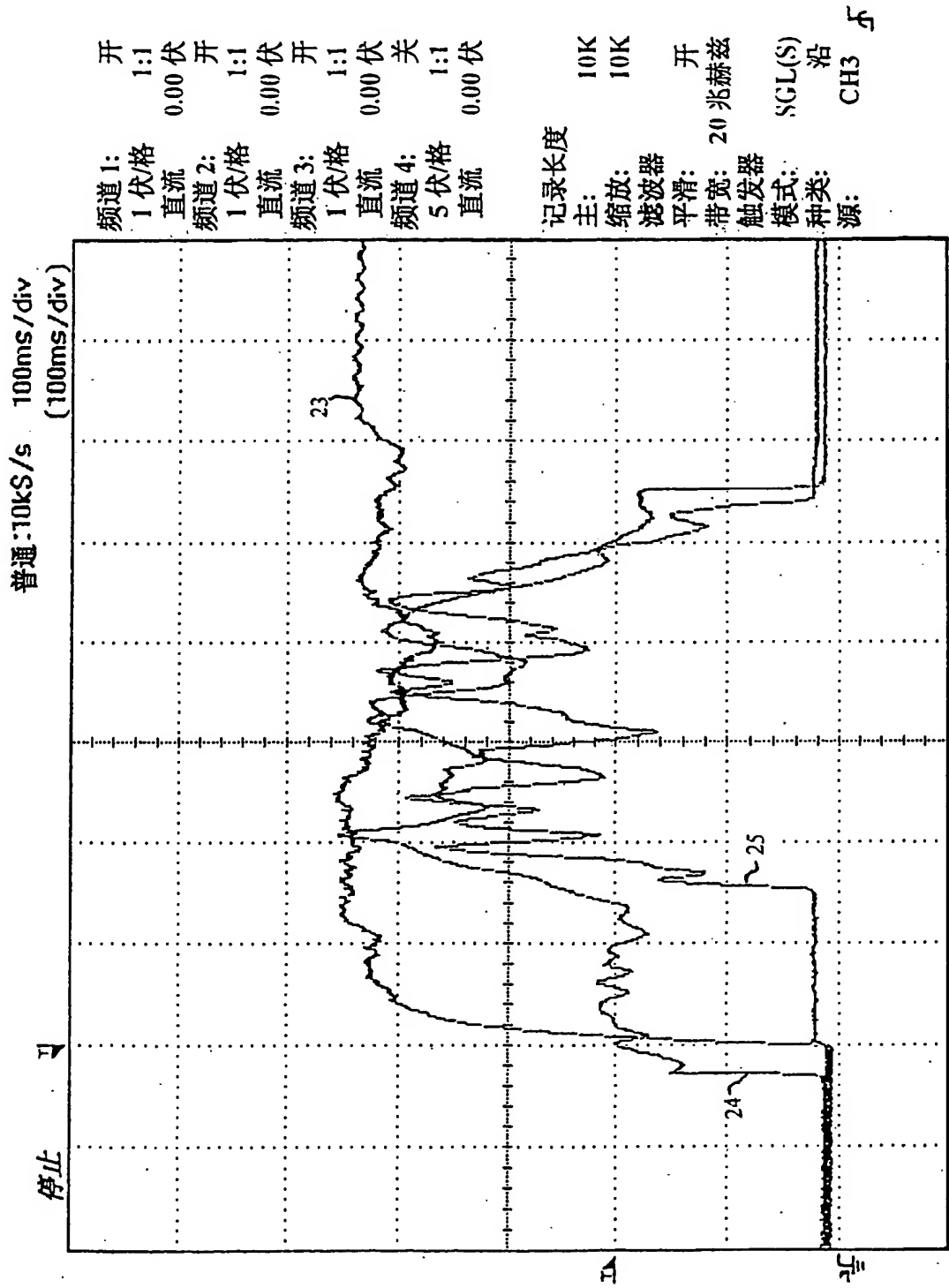


图 10

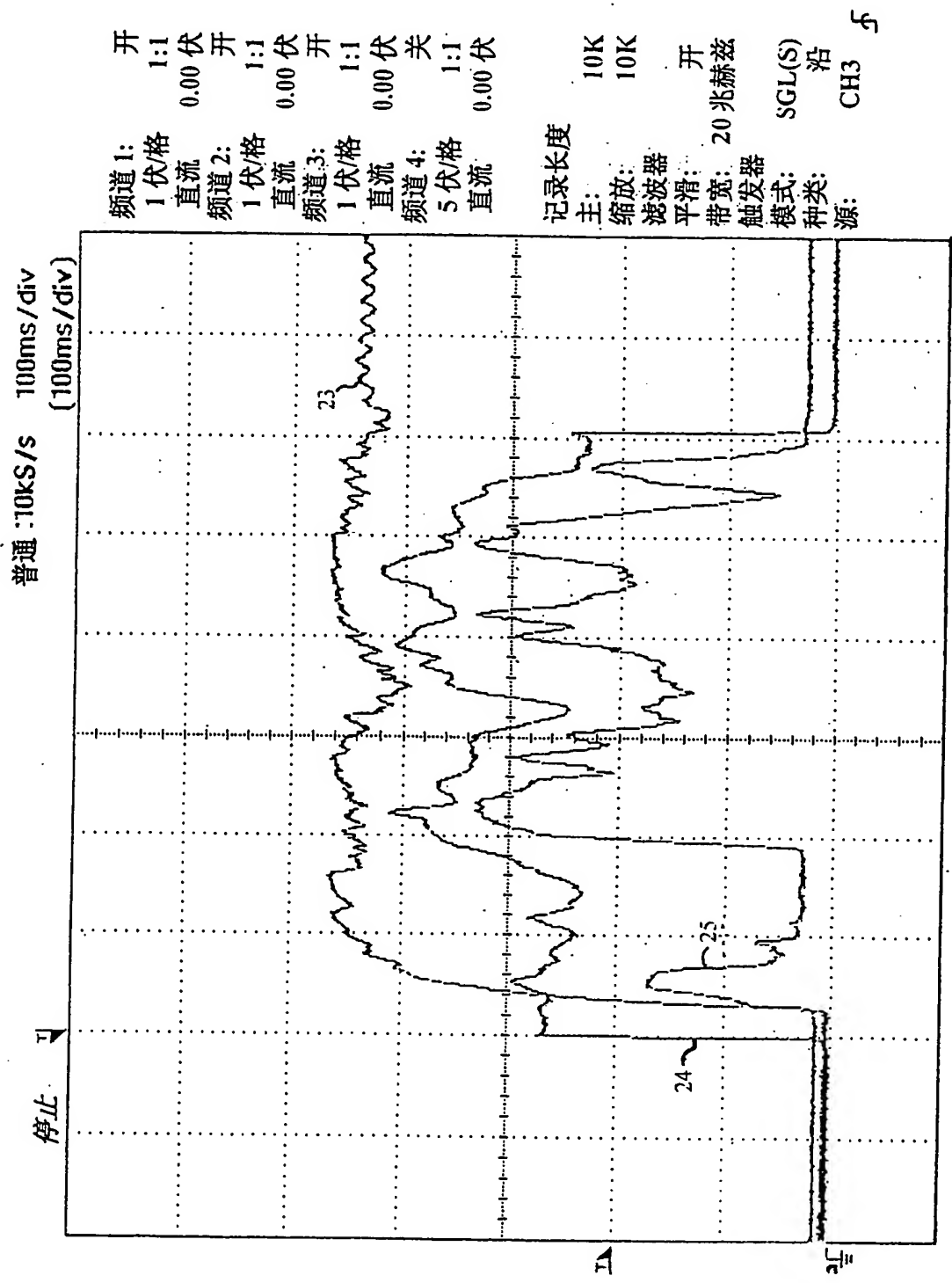


图 11

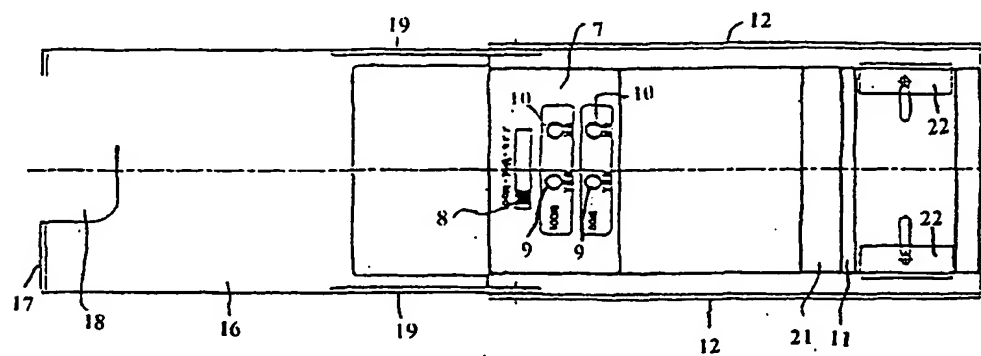


图 12

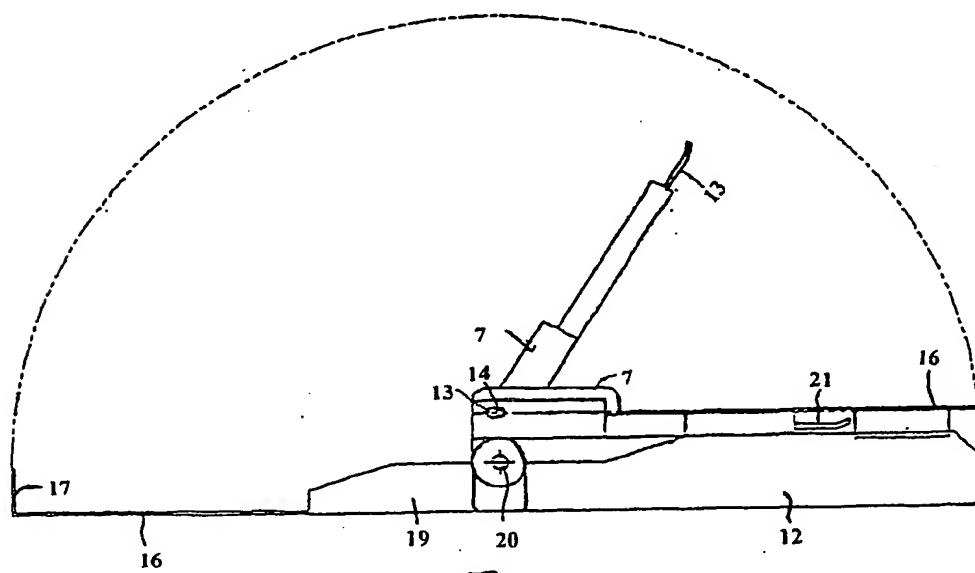


图 13

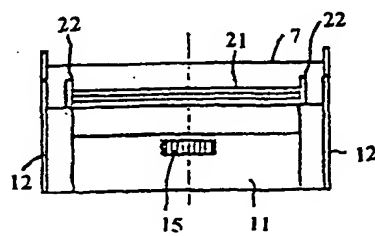


图 14

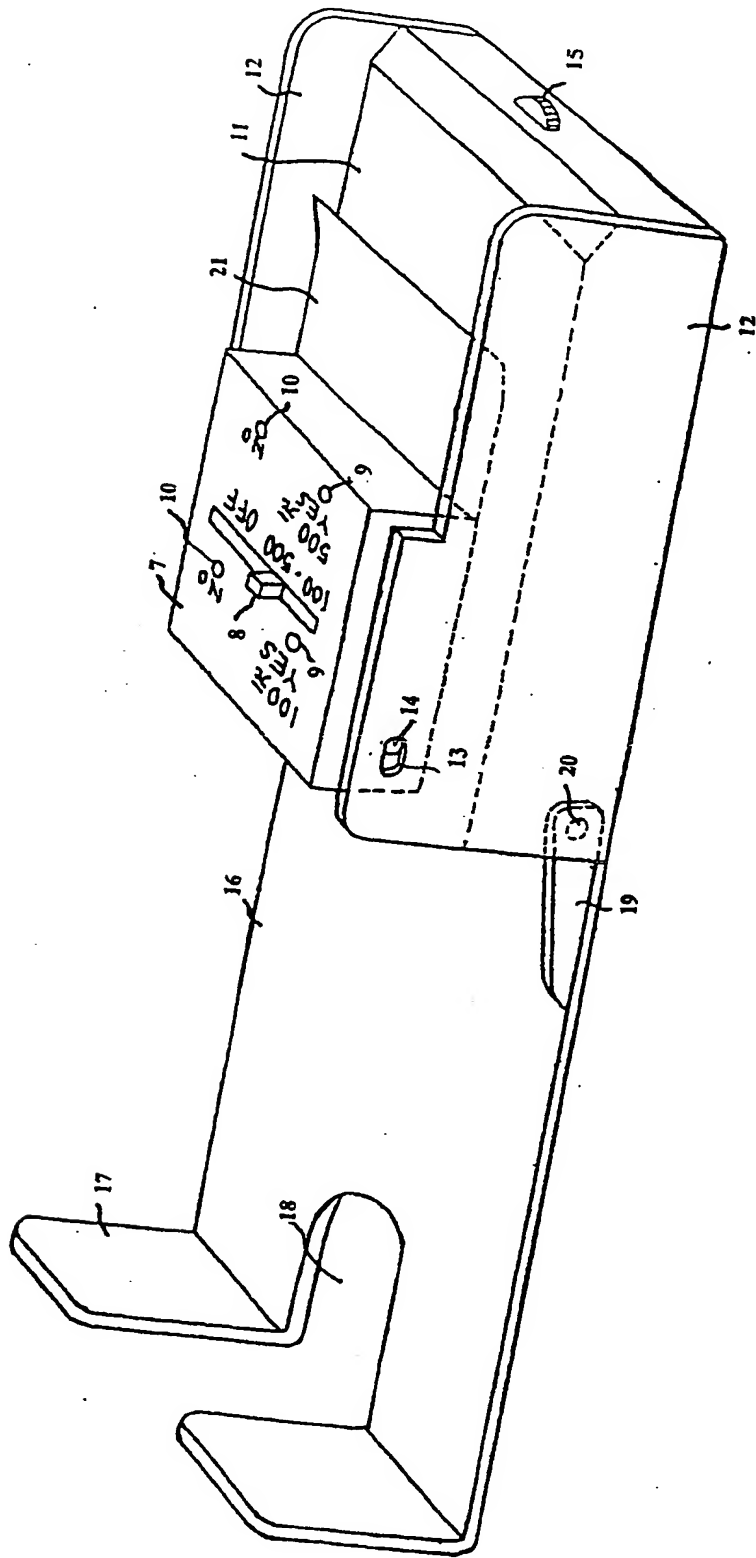


图 15